Sun™ Ultra™ Enterprise™ 450

Just the Facts

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Ultra™ Enterprise™ 450

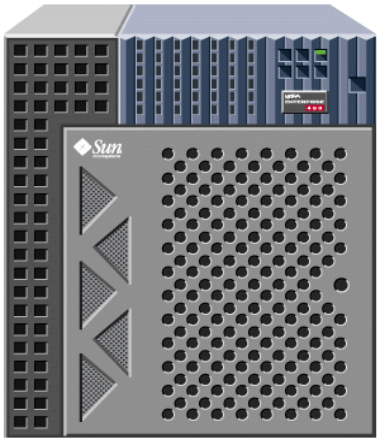


Figure 1. Ultra™ Enterprise 450™, Front View

Rack-mountable Tower	• Fits in open office or standard 19-inch rack • 22.9 x 17.6 x 27.4 (inches) / 58.1 x 44.8 x 69.6 (cm)
One to four CPUs	• 250-MHz or 300-MHz UltraSPARC™-II
Up to 4-GB memory	• 16 DIMM slots • SPARCstation 20-style memory modules
Up to 84-GB Internal Storage	• Up to 20 4.2-GB, 7200-rpm UltraSCSI disks • Five separate UltraSCSI channels • 200-MB per second internal disk I/O
Up to 6-TB External Storage	• Up to 20 Fast/Wide or UltraSCSI channels
Ten PCI slots	• Seven 64-bit slots • Three PCI66 (66-MHz) slots
1-GB per second I/O throughput	• Six independent PCI I/O buses
11,559 TPM	• OLTP performance (TPC-C)
Datacenter RAS features	• Automatic System Recovery (ASR) • Hot-swap disks • Redundant hot-swap power supplies • Thermal sensing, auto fan control • Solstice™ SyMON™ System Monitor
Operating system support	• Solaris™ 2.5.1: Hardware 4/97 • Solaris 2.5.1: Hardware 8/97 • Solaris 2.6
Typical Customer Applications	• Database/Datamart • Business-Critical Applications • Workgroup Support/Groupware • Intranet/Internet/Web • Digital media/video
Key messages	• Scalable performance • Price/performance • Reliability and Availability • Application growth path

Introduction

The Sun Ultra Enterprise 450 is the latest member of Sun's powerful line of UltraSPARC-based servers for enterprise network computing. This tremendously flexible and versatile mid-range server delivers a potent combination of stellar performance, outstanding reliability, and a remarkably affordable price. This new rack-mountable tower server's exceptional blend of computing power, storage capacity, disk I/O throughput, and network I/O performance make it perfect for running or front-ending databases from Oracle, Sybase, and Informix, delivering e-mail or web services to hundreds of concurrent users, or for implementing thousands of other critical two-tier and three-tier client-server business applications.

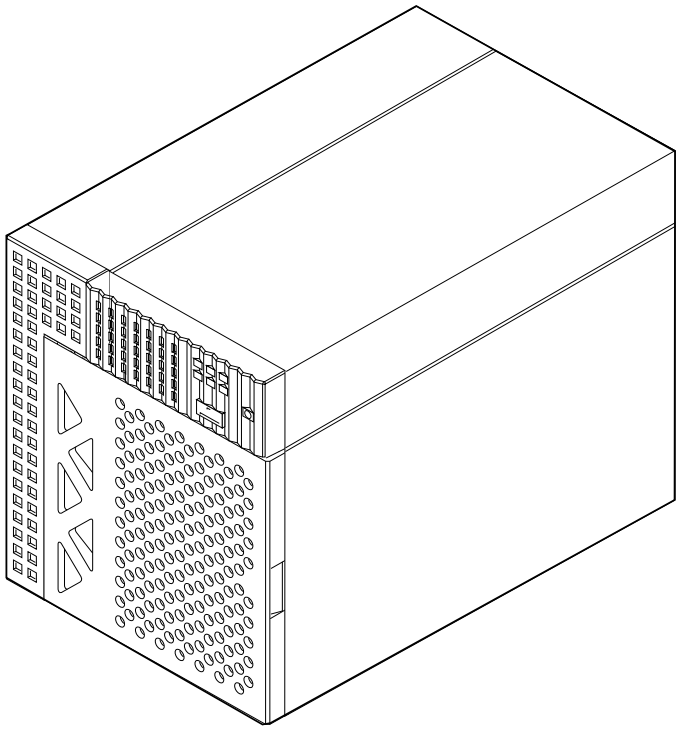


Figure 2. Ultra Enterprise 450, Rear View

With up to four 250-MHz or 300-MHz UltraSPARC-II 64-bit RISC microprocessors, 4 GB of memory, 20 internal 4.2-GB UltraSCSI-3 disk drives, and six high-performance PCI I/O buses that can move over one gigabyte of data per second, the Ultra Enterprise 450 is ideal for applications that demand more processing power, integrated storage, or expandability than offered by the Ultra Enterprise 2, but that don't require the seamless growth path or extensive datacenter RAS features offered by the Ultra Enterprise 3000–6000 family. It is designed to satisfy many of the demanding information management, processing, and delivery requirements found in medium-sized businesses, branch offices, workgroups, and distributed applications within large-scale or global enterprises:

- Database management or digital media management (20 GB to 2000 GB)
- Distributed database access
- Distributed file management, HTTP and FTP services, NC boot services
- E-mail, web mail services, Internet gateway, legacy host gateway
- On-line Transaction Processing (OLTP), electronic commerce
- Decision support and On-line Analytical Processing (OLAP)
- Simulation
- Groupware (such as Lotus Notes)
- Print services
- Network management, message routing, and network backup

Key Features and Benefits

• Features	• Benefits
– Up to four 250- MHz or 300-MHz UltraSPARC-2 CPUs, each with 2-MB E-cache (1 MB on 250-MHz CPUs); up to 4 GB of ECC memory (requires 256-MB DIMMs) with two-way or four-way interleaving	– Scalable computing performance provides support for heavy compute-intensive applications such as database management, decision support, or simulation
– Five-segment Ultra™ Port Architecture (UPA) crossbar datapath moves up to 1.6 GB of data per second between CPUs, memory, and I/O channels	– High-speed parallel data flows ensure minimum latency and maximum system resource utilization for sustained high performance under the heaviest workloads
– Six high-performance industry-standard PCI I/O buses supporting ten PCI slots plus onboard UltraSCSI, 10/100 Ethernet, and serial and parallel ports deliver up to 1-GB per second total I/O throughput	– Blazing I/O performance makes the Ultra Enterprise 450 a superior file, web, or database server, especially for large multimedia files; it is also a premier boot server for Java enabled “thin client” desktop systems
– Five 40-MB per second UltraSCSI controllers support up to 20 internal 4.2-GB, 7200-rpm disks; supports up to 6 TB external storage	– With up to ten times the disk I/O performance of similarly priced systems, the Ultra Enterprise 450 surpasses every machine in its price range for file, web, database, or digital media server applications
– Multiple independent datapaths, error correcting code (ECC) protection for memory and data paths, Automatic System Recovery, redundant hot-swap power supplies, hot-swap disk drives, RAID 0, 1, 0+1, and 5, thermal sensing and auto fan control, overtemp protection, four levels of diagnostics, and high-availability cluster configuration options	– The extensive array of reliability, high-availability, and serviceability features of the Ultra Enterprise 450 allows customers to deploy these systems in their most business-critical environments with complete confidence

Key Features and Benefits *(cont.)*

- **Features**
  - The Ultra Enterprise 450 runs Sun's powerful and dependable Solaris network operating system and is 100 percent binary compatible with all software that runs on Sun's Ultra Enterprise 3000–6000 server family
  - Solaris for Intranets includes many new features, such as Solaris easy installer, Solstice SyMON, Sun™ WebServer™, DHCP, PPP, and file and print support for Windows, NetWare, and Macintosh clients
- **Benefits**
  - Solaris, recognized as the industry's leading enterprise network operating system, runs over 12,000 of the most extensively tested, highest quality software packages available today for both commercial and technical applications
  - Ultra Enterprise 450 customers can deploy systems with confidence, knowing their applications can grow and their investment in network technology, software, and training will be protected
  - Extensive new software tools make it easier than ever to install and use Sun Ultra Enterprise servers for a wide range of applications throughout the enterprise network

Target Industries

Industry	Applications
Financial Services – Insurance – Banking – Securities traders and brokerages	• Branch office servers, customer management (CMS), electronic commerce
Publishing	• Digital media management, web publishing, electronic commerce
Manufacturing – Automotive – Aerospace – Electronics – Pharmaceuticals and process industries	• IT, finance and accounting, HR, manufacturing, engineering, sales and marketing, customer service/CMS, electronic commerce
Telecommunications and Internet Services – Long distance carriers, PTTs – RBOCs – Cable operators – Wireless operators – Internet service providers – Equipment OEMs	• Internet HTTP, e-mail, FTP, directory servers, electronic commerce • CMS, billing, fraud detection, network monitoring and reporting, software development
Retail – Major retail chains	• In-store electronic retail systems, HQ customer management, merchandising systems, inventory management, distribution, electronic commerce
Government – Federal/National – State/Provincial	• Branch office systems
Health Care – Hospitals and clinics – HMOs and managed care providers – Medical equipment OEMs	• Satellite office servers, patient records, billing, claims processing, medical imaging systems, picture archival and communications systems
Education – Colleges and universities	• Registration and student records, library management, financial aid administration, academic research

Target Applications

Target Applications	Key Features to Highlight
E-mail **Web mail services** **Internet gateway** **Legacy host gateway**	• Connectivity with heterogeneous systems and networks – TCP/IP, IPX™/SPX, NetBEUI, NetBIOS, OSI, X.25, SNA, DECnet – Ethernet, Token Ring, FDDI, ATM, ISDN, T1, E1 – MS mail, UNIX® mail, POP3, IMAP • Exceptionally scalable multi-thread performance • Exceptional total system throughput
Database or Digital Media Management • From 20 GB to 2000 GB • Oracle, Informix, Sybase	• Storage capacity (84-GB internal, 6-TB external) • Outstanding storage I/O performance • Exceptional network connectivity and I/O bandwidth
Distributed database access	• Outstanding network connectivity, computing power, network I/O performance, total system throughput • Reliability and availability features
On-line Transaction Processing (OLTP) **Electronic commerce** **Business applications**	• Outstanding computing power, storage I/O performance, network I/O performance, reliability and availability features • Over 12,000 top software applications • Robust development environment • Scalable O/S, broad product line for enterprise-wide deployment
Groupware, Collaboration • Lotus Notes	• Enterprise networking and PC interoperability • Supports hundreds of UNIX or PC clients
Decision support and **On-line Analytical Processing (OLAP)**	• Outstanding computing power • Storage capacity and storage I/O performance
Distributed File Access, File Management • Distributed NFS™, NetWare, LAN Manager file management • HTTP and FTP services • NC boot services	• Robust, secure, distributed file sharing with NFS version 3 • Enterprise networking and PC interoperability
Internet	• Secure, reliable, and cost-effective • Sun is the leading Internet provider; the majority of the servers on the Internet are Sun servers
Simulation	
Network monitoring and management **Message routing** **Network backup**	• Infrastructure and tools to reduce systems management effort • Proven expertise in large-scale networking; eases difficulties in managing PC LANs

Ultra Enterprise Server Family Comparisons

Ultra Enterprise 450 versus Ultra Enterprise 2 and 3000 Servers

As a member of Sun's Ultra Enterprise family of servers, the Ultra Enterprise 450 is positioned between the Ultra Enterprise 2 and the Ultra Enterprise 3000. The charts below compare the features of these three servers.

Key Features	Ultra Enterprise 2 (2-CPU configuration)	Ultra Enterprise 450 (4-CPU configuration)	Ultra Enterprise 3000[1] (4-CPU configuration)
Product positioning	• Compact dual-processor network application server for medium-size compute-intensive applications • Suitable for small-to-medium database applications and websites	• Affordable high performance 4-way SMP network application server • Reliable, high-capacity mid-range tower server • For larger websites, branch offices, workgroups, or distributed enterprise applications • Ideal for managing larger files	• Highly reliable and expandable mid-range server • For fast-growing small-to-medium-size business-critical applications • Exceptional investment protection for high growth applications
Packaging	• Desktop enclosure • 130mm x 450mm x 444mm (H x W x D)	• Rack-mountable deskside tower • 581mm x 448mm x 696mm (H x W x D)	• Rack-mountable tower • 650mm x 430mm x 600mm (H x W x D)
CPUs	• 167 MHz, 200 MHz, or 300 MHz • 512-KB, 1-MB or 2-MB E-cache • Up to two CPUs • Modular CPUs can be added one at a time	• 250 or 300 MHz • 1-MB or 2-MB E-cache • Up to four CPUs • Modular CPUs can be added one at a time	• 167 or 250 MHz • 512-KB, 1-MB or 4-MB E-cache • Up to six CPUs • Modular CPUs can be added one at a time
Memory	• 16 DIMM slots • 5V 60 nanosecond DIMMs • 64 MB to 2 GB • 576-bit-wide data path • Minimum/maximum latency = 30 to 170 nanoseconds • Memory added in groups of four DIMMs • two-way or four-way interleaving	• 16 DIMM slots • 5V 60 nanosecond DIMMs • 128 MB to 4 GB (requires 256 MB DIMMs) • 576-bit-wide data path • Minimum/maximum latency = 30 to 130 nanoseconds • Memory added in groups of four DIMMs • two-way or four-way interleaving	• 16 DIMM slots per CPU/Memory Board • 32 DIMMs with four CPUs installed • 3.3V 60 nanosecond DIMMs • 64 MB to 6 GB (six-CPU configuration) • 576-bit-wide data path • Minimum/maximum latency = 30 to 300 nanoseconds • Memory added in groups of eight DIMMs • Up to 16-way interleaving

1 For this comparison, the E3000 is configured as a 4-way server with two CPU/Memory boards and two I/O boards.

Ultra Enterprise Server Family Comparisons *(cont.)*

Ultra Enterprise 450 versus Ultra Enterprise 2 and 3000 Servers *(cont.)*

Key Features	Ultra Enterprise 2	Ultra Enterprise 450	Ultra Enterprise 3000
System Bus	• Three-segment UPA • 1.6-GB/second peak throughput • Runs at 83 MHz with 167-MHz CPU installed, or 100 MHz with 200-MHz or 300-MHz CPU installed	• Five-segment UPA • 1.6-GB/second throughput • Runs at 83 MHz with 250-MHz CPU installed or 100 MHz with 300-MHz CPU installed	• Gigaplane™ (2.6-GB/second) to UPA (1.3-GB/second) • Gigaplane and UPA run at 83 MHz
I/O	• One SBus, four slots • 20-MB/second Fast/Wide SCSI • 10/100 Ethernet port • 64K sync and 76.8K async serial ports, DB25 • Parallel port • 100-MB/second maximum system I/O throughput	• Six PCI buses, 10 PCI slots • 40-MB/second UltraSCSI, 20-MB/second Fast/Wide SCSI • 10/100 Ethernet port • One 384K sync serial port, one 460K async port; DB25 • Parallel port • 1-GB/second max system I/O throughput	**(4-CPU configuration)** • Four SBuses, 6 SBus slots • Four 25-MB/second FC ports • Two 20-MB/second Fast/Wide SCSI • Two 10/100 Ethernet ports • 400-MB/second max system I/O throughput ***or*** • Four PCI buses, 4 PCI slots • Two 20-MB/second Fast/Wide SCSI • Two 10/100 Ethernet ports Either configuration includes two sync/async serial ports and one parallel port
Storage	• Internal bays for one or two 4.2-GB, 7200-rpm, 3.5-inch x 1-inch disk drives • 1 x 20-MB/second Fast/Wide SCSI • 4.2-GB or 8-GB internal storage • Up to 1-TB external storage	• Internal bays for twenty 4.2-GB, 7200-rpm 3.5-inch x 1-inch hot-plug drives • 5 x 40-MB/second UltraSCSI • Up to 84-GB internal storage • Up to 6-TB external storage	• Internal bays for ten 9-GB, 5,400-rpm 3.5-inch x 1.6-inch hot-plug drives • 1 x 20-MB/second Fast/Wide SCSI • Up to 91-GB internal storage • Up to 6-TB external storage
Removable Media	• 1.44-MB floppy drive (optional) • 4X CD-ROM (standard) • External SCSI tape devices (optional)	• 1.44-MB floppy drive (standard) • 12X CD-ROM (standard) • Internal 5.25-inch, half-height, SCSI 4mm or 8mm tape device (optional) • External SCSI tape devices (optional)	• No floppy drive • 12x CD-ROM (standard) • Internal 5.25-inch, half-height, SCSI 4mm, 8mm, or QIC tape device (optional) • External SCSI tape devices (optional)

Ultra Enterprise Server Family Comparisons *(cont.)*)

Ultra Enterprise 450 versus Ultra Enterprise 2 and 3000 Servers *(cont.)*

Key Features	Ultra Enterprise 2	Ultra Enterprise 450	Ultra Enterprise 3000
System Console	• TurboGX™ SBus frame buffer with 17-inch or 20-inch color monitor	• Low cost PCI frame buffer with 17-inch or 20-inch color monitor	• TurboGX SBus or PGX PCI frame buffer with 17-inch or 20-inch color monitor
Power	• 110 V/220 V • 400 W	• 110 V/220 V • 1120 W	• 110 V/220 V • 1100 W
Performance	@ 2 x 300 MHz, plus 2 MB E-cache • SPECint95 = 12.3 • SPECfp95 = 20.2 • Est. SPECrate_int95 = 186 • Est. SPECrate_fp95 = 237 • Est. LADDIS = 5,350 • Est. TPM = 5,300	@ 4 x 300 MHz, plus 2 MB E-cache • SPECint95 = 12.4 • SPECfp95 = 29.5 • SPECrate_int95 = 422 • SPECrate_fp95 = 561 • Est. LADDIS = 9,600 • TPM = 11,559.70	@ 4 x 250 MHz, plus 4 MB E-cache • SPECint95 = 10.4 • Est. SPECfp95 = 24.5 • Est. SPECrate_int95 = 371 • Est. SPECrate_fp95 = 497 • Est. LADDIS = 7,808 • Est. TPM = 7,600
RAS features	• Integrated design, fewer connections • ECC protection for memory and datapaths • RAID 0, 1, 0+1, and 5 • Four levels of diagnostics • High-availability cluster configuration options	• Integrated design, fewer connections • Multiple independent datapaths • ECC protection for memory and datapaths • Automatic System Recovery • Redundant hot-swap power supplies • Hot-swap disk drives • RAID 0, 1, 0+1, and 5 • Thermal sensing and auto fan control • Overtemp protection • Four levels of diagnostics • High-availability cluster configuration options	• Multiple independent datapaths • ECC protection for memory and datapaths • Automatic System Recovery • Dynamic System Reconfiguration • Redundant hot-swap power supplies • Hot-swap disk drives • RAID 0, 1, 0+1, and 5 • Hot-swap CPU and I/O modules • Thermal sensing and auto fan control • Fault tolerant cooling with overtemp protection • Four levels of diagnostics • High-availability cluster configuration options
Warranty	• 1-year, on-site, next-day service	• 3-year, on-site, second-day service	• 1-year, on-site, next-day service

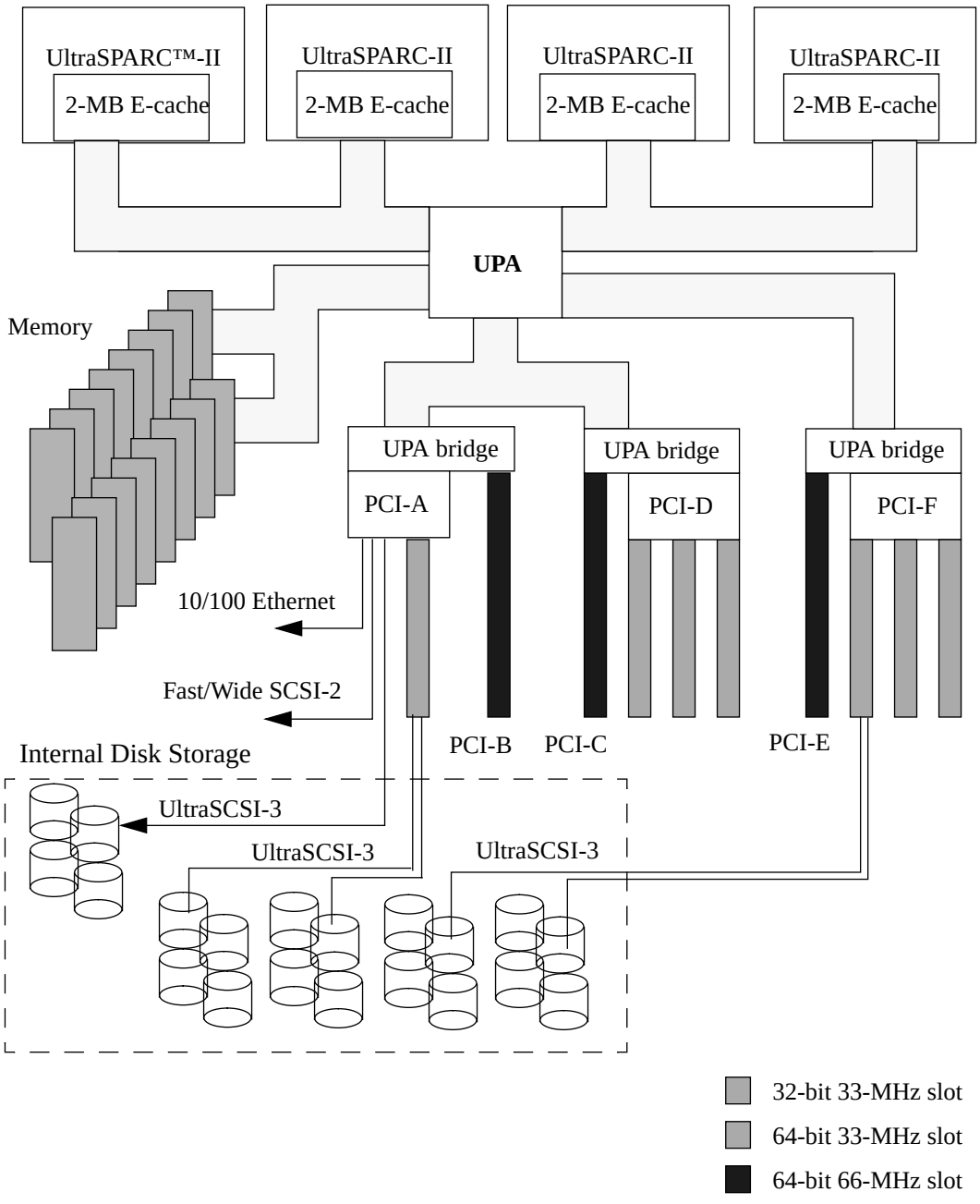


Figure 1. Ultra™ Enterprise™ 450 Architecture

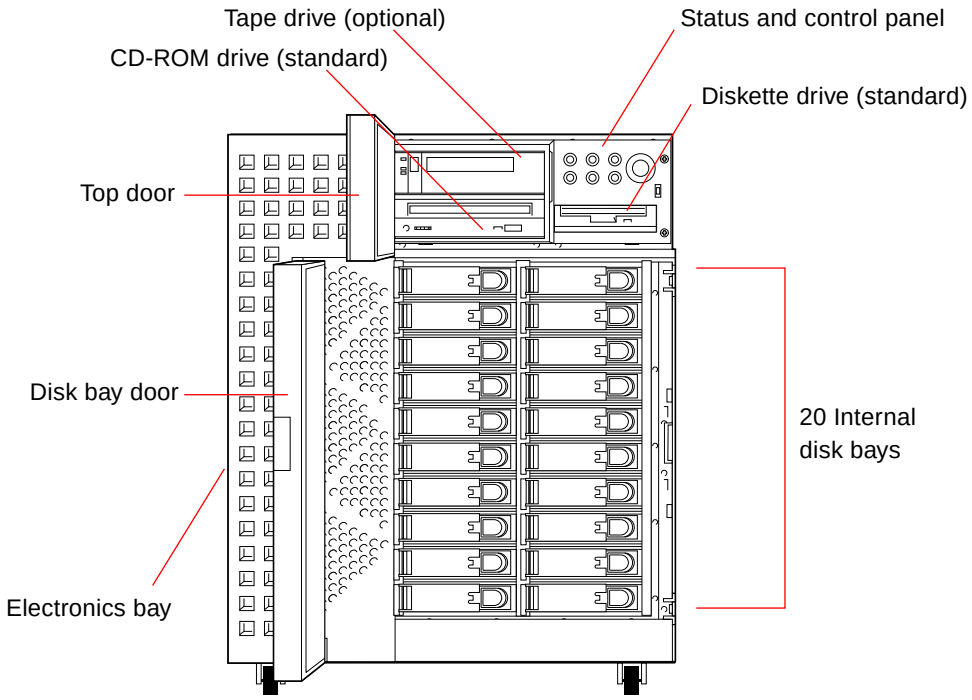


Figure 2. Ultra Enterprise 450, Front View, Panels Open

UltraSPARC™-II Processors

The Ultra Enterprise 450 is a shared-memory, symmetric-multiprocessing system built around the UltraSPARC™-II microprocessor. The UltraSPARC-II is Sun's latest generation of the SPARC™ family and the second generation of 64-bit UltraSPARC chips. It utilizes the latest 0.35-micron technology (versus the 0.5-micron technology of UltraSPARC-I), which shrinks the die size to 149^2mm (from 218^2mm). This reduced die size is the key to the higher clock rates and increased performance of UltraSPARC-II. This smaller die size also enables the UltraSPARC-II to operate at a core voltage of 2.5 volts, rather than at the 3.3 volts, of the UltraSPARC-I. This lower voltage reduces power consumption and allows the chip to operate at higher frequencies without increasing total power requirements or heat dissipation, both major design issues in today's high performance systems.

UltraSPARC-II processors used in the Ultra Enterprise 450 are individually mounted on 4-inch x 6-inch field-installable module cards along with associated Ultra™ Port Architecture (UPA) data buffers and 2 MB of high-speed SRAM external cache memory (1-MB cache with 250-MHz CPU). These modules are similar to those used in the Ultra Enterprise 2 server and Ultra 30 workstations. This modular design facilitates easy system expansion (adding additional CPUs), processor upgrades (to higher performance UltraSPARC processors), and system service.

UltraSPARC-II Processors *(cont.)*

The Ultra Enterprise 450 server is designed to exploit the full processing power of up to four high performance UltraSPARC-II CPUs. Processors with clock rates of 250 MHz or 300 MHz are supported, although all processors installed in a single system must operate at the same clock frequency. The system's UPA interconnect, main memory, and I/O subsystems have been carefully architected to sustain the high data rates necessary to use these processors fully, resulting in highly scalable system performance that is remarkably linear from a lightly loaded uniprocessor configuration to a "maxed-out" four processor system.

Ultra Port Architecture System Interconnect

The processors, memory, and I/O subsystems of the Ultra Enterprise 450 are interconnected by a high-speed, five-segment UPA crossbar datapath. This is an enhanced implementation of the same UPA design used in the Ultra Enterprise 1, 2, and 150 servers. Two UPA segments support pairs of CPU modules, two support system I/O, and one provides the system datapath to main memory. The two CPU datapaths are 144 bits wide, with 128 bits for data and 16 bits for error correcting code (ECC). The two UPA datapaths that support system I/O are 72 bits wide, with 64 bits for data and 8 bits for ECC. The memory datapath is 576 bits wide, with 512 bits (64 bytes) for data and 64 bits for ECC.

Each UPA segment operates independently of the others and moves data blocks over a parallel datapath between client buffers and UPA switch buffers. Transfers are completed at a clock rate that is automatically synchronized by the system controller to one-third or one-quarter that of the system's CPU clock rate. With 250-MHz CPUs installed, the UPA clocks at 83.3 MHz, and with 300-MHz CPUs installed, the UPA transfers data at 100 MHz, or one transfer every ten nanoseconds. CPU segments, which transfer 16 bytes of data in parallel each clock cycle, each have a maximum transfer rate of 1.6 GB per second. I/O segments, which transfer 8 bytes in parallel each clock cycle, each have a maximum transfer rate of 800 MB per second. Memory transfers require three UPA clock cycles to complete (depending on clock speed), producing a maximum memory I/O throughput of 1.78 GB per second.

Since each UPA segment operates independently of the others, all segments can be transferring data between local and switch buffers concurrently. CPU segments move data from 64-byte buffers at the crossbar switch to 16-byte local buffers during four consecutive UPA clock cycles, and I/O segments move data from 64-byte crossbar buffers to 8-byte local buffers during eight consecutive UPA clock cycles. Once its local buffer is filled with outbound data, a client on a shared UPA segment arbitrates for control of the segment, then transfers its data to the segment's switch buffer during the requisite number of clock pulses.

All UPA addressing and arbitration occurs over signal lines which are separate from the datapaths. This arrangement allows arbitration and addressing to occur in parallel with data transfers, reducing transfer latency and improving datapath utilization.

Memory

The Ultra Enterprise 450 supports up to four GB of 60 nanoseconds, 5-volt dynamic RAM memory (2 GB with currently available 128-MB Sun memory DIMMs). DIMMs used by the Ultra Enterprise 450 are the same type as those used in the Ultra Enterprise 1, 2, and 150. Memory is organized into four banks of four dual in-line memory modules (DIMMs). All four DIMMs within the same bank must be identical, and can range in capacity from 32 MB each to 256 MB each. DIMMs in different banks can have different capacities.

Data moves between memory and the UPA crossbar switch buffers over an ECC protected 64-byte-wide datapath. A memory read or write operation to a single memory location requires approximately twelve UPA clock cycles to complete (approximately 120 nanoseconds with current memory chips).

With two banks of identical DIMMs installed, memory operations are two-way interleaved, reducing the average latency for reads and writes almost by half, and nearly doubling the memory throughput over non-interleaved operations. With four banks of identical DIMMs installed, memory read-write operations are four-way interleaved, nearly doubling throughput again over two-way interleaved operation. With four-way interleaving enabled, average memory latency is reduced to approximately 36 nanoseconds, yielding an average memory throughput of 1.6 GB per second. If only one or three banks of DIMMs are present, or if the DIMMs in different banks have different capacities, interleaving will not occur.

System I/O

All system communications with storage peripherals and network interface devices is mediated by three UPA-to-PCI bridges, located on the system's main logic board. Each of these bridge chips manages communication between the UPA bus and two industry-standard Peripheral Component Interconnect (PCI) data buses, giving the system a total of six separate PCI buses. Two bridges (four PCI buses) share one 800-MB per second UPA segment while the third bridge has uncontested use of the other UPA I/O segment.

Each bridge chip provides buffered data transfers between the UPA and one 66-MHz PCI bus and one 33-MHz PCI bus. Each bridge is capable of sustained data transfer rates of over 334 MB per second with either one or both supported PCI buses active. With all three bridges transferring data, total system I/O can exceed one gigabyte per second.

Together, the system's six PCI buses support slots for up to ten PCI interface cards. One PCI bus (bus B) also handles communications between the system and devices connected to the main logic board's SCSI, FastEthernet, serial, parallel, and keyboard/mouse ports. All PCI buses in the Ultra Enterprise 450 comply with the 2.1 revision of the PCI specification, released in March 1995.

- PCI buses A, C, and E operate at 33 MHz or 66 MHz and provide one (1) slot each for either a 32-bit or 64-bit 3.3-volt or universal PCI card.
- PCI bus B operates at 33 MHz and provides one (1) slot for a 32-bit 5-volt or universal PCI card. PCI-B also supports all system-board I/O (see below).
- PCI bus D operates at 33 MHz and provides two (2) slots for 32-bit 5-volt or universal cards and one (1) slot for a 32-bit or 64-bit 5-volt or universal card.
- PCI bus F operates at 33 MHz and provides three (3) slots for either 32-bit or 64-bit 5-volt, or universal PCI cards.

System I/O *(cont.)*

Enterprise 450 PCI Bus/Slot Layout and Slot Characteristics					
PCI Slot Number	**PCI-UPA Bridge**	**PCI Bus**	**Slot Width/ Card Widths Supported**	**PCI Clock Rate, MHz**	**Card Input Voltages Supported**
10	1	B	32/32 bits only	33	5V or Universal
9	3	F	32/32, 64 (as 32)	33	5V or Universal
8	3	F	32/32, 64 (as 32)	33	5V or Universal
7	3	F	64/32, 64	33	5V or Universal
6	3	E	64/32, 64	33, 66	3.3V or Universal
5	1	A	64/32, 64	33, 66	3.3V or Universal
4	2	C	64/32, 64	33, 66	3.3V or Universal
3	2	D	64/32, 64	33	5V or Universal
2	2	D	64/32, 64	33	5V or Universal
1	2	D	64/32, 64	33	5V or Universal

In addition to the I/O capabilities available through PCI option cards, the Ultra Enterprise 450 provides the following I/O channels directly from the main system board through PCI bus B:

- One (1) internal-only 40-MB per second UltraSCSI-3 channel which supports the system's four standard 3.5-inch UltraSCSI disk bays
- One (1) internal/external 20-MB per second Fast/Wide SCSI-2 channel; supports the standard CD-ROM drive plus one optional, internal, narrow (8-bit) SCSI tape device; one (1) external 68-pin SCSI connector supports connections to up to four external SCSI tape devices or a single SPARCstorage MultiPack
- One (1) internal-only floppy drive controller port supports the standard 3.5-inch 1.44-MB floppy drive
- One (1) external 10/100 auto-select Ethernet port that supports either a Cat-5 UTP (RJ45 connector) or 40-pin miniature "D" MII connection
- Two (2) external EIA-232D or EIA-423 serial ports, one synchronous and one asynchronous, via one DB25 connector with a Y splitter cable (without the splitter cable, the default output is synchronous); supports EIA-423 synchronous data rates from 50 baud to 384 Kbps, and asynchronous data rates from 50 baud to 460.8 Kbaud
- One (1) external 2-MB per second Centronics-compatible, bi-directional EPP parallel port with one DB25 connector
- One (1) external standard Sun keyboard/mouse port (mini DIN-8 connector)

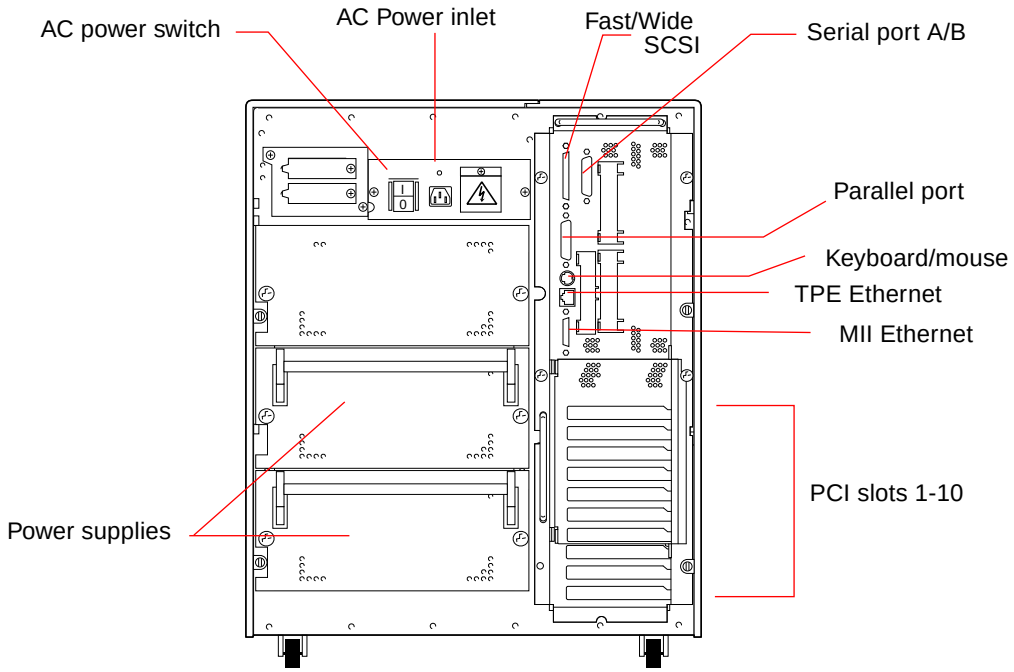


Figure 3. Ultra Enterprise 450, Rear View, Panels Open

Storage

Primary (internal) data storage for the Ultra Enterprise 450 is provided by up to twenty 4.2-GB, 3.5-inch by 1-inch hot-swappable UltraSCSI-3 disk drives. These 7200-rpm drives have an average access time of 14 milliseconds and a peak internal transfer rate of up to 140 Mbits per second. Drives are attached in groups of four to five separate single-ended UltraSCSI controllers, each of which offers a peak data transfer rate of 40 MB per second, twice the transfer rate of Fast/Wide SCSI controllers. The first four drives attach to the UltraSCSI port on the system motherboard. Drives five through twenty attach to two dual-channel UltraSCSI controllers, which occupy two PCI slots. With all five controllers installed, disk I/O between internal drives and the UPA can approach 200 MB per second.

Spreading the internal drives across five UltraSCSI buses allows multiple system processes to execute disk read-write operations simultaneously. This significantly reduces disk I/O latency by reducing the number of queued I/O requests at each controller and by reducing contention between drives for access to the SCSI bus. It also allows large files of data to be striped across multiple drives and controllers, further enhancing disk I/O performance by reducing request queueing and bus arbitration delays. The result is superior total disk I/O throughput compared with single- or dual-controller implementations. Multiple disk I/O channels also increase total system availability by allowing drives on one controller channel to be hot-swapped without disrupting user access to data stored on other SCSI buses.

To satisfy the needs of customers with larger data storage requirements, the Ultra Enterprise 450 supports a variety of external storage subsystems. PCI storage controllers provide support for Sun's SPARCstorage UniPacks and MultiPacks, and SPARCstorage™ RSM™ trays. The Sun™ RSM Array™ 2000 will be supported in the very near future. With twenty fully configured RSM Array 2000s attached through ten dual-channel UltraSCSI storage controllers, the Ultra Enterprise 450 can access over six TB of local data.

Storage *(cont.)*

Storage management software such as Sun's Solstice™ DiskSuite™ and VERITAS Volume Manager enables the Ultra Enterprise 450 to support disk striping (RAID 0), mirroring (RAID 1), striping with parity (RAID 5), and striping plus mirroring (RAID 0+1).

In addition to its internal and external high-speed fixed storage capabilities, the Ultra Enterprise 450 provides a standard 12X CD-ROM drive and a 1.44-MB 3.5-inch, manual-eject, floppy drive for software installation and system management. An internal 5.25-inch, half-height (1.6-inch high) drive bay is provided for an additional narrow (8-bit) SCSI device, such as a 4mm DDS-2 or DDS-3 tape drive, or an 8mm tape drive. Additional externally attached tape drives, autoloaders, or libraries can be attached by to the system's external Fast/Wide SCSI port or to optional PCI SCSI controller cards.

Console System

The Ultra Enterprise 450 can be managed from either a local or remote (network) console device. A local character terminal console device can be attached through one of the system's two serial ports, or a color monitor, keyboard, and mouse can be attached to any supported PCI graphics controller/framebuffer and the keyboard/mouse port. The system can be managed remotely from any X-windows terminal or workstation.

The four-position front panel key switch controls system power as well as administrator access to the system's Power-On Self-Test (POST) diagnostics and flash-upgradable PROM.

The system flash-upgradable boot PROM provides standard OpenBoot™ capabilities, power-on self-test, and extensive OpenBoot diagnostics.

Six front panel LEDs provide system administrators with easy to interpret status information about the health of the system motherboard, CPUs, memory, disks, cooling fans, and power supplies.

Power Distribution System

System power is provided by one, two, or three 560W universal DC power supplies. These modular hot-swap units are easily installed and removed from the rear of the system, even while the machine is operational. Maximally configured systems will operate continuously with two power supplies installed.

Power supplies feed all active system components through a common power distribution bus. Power is drawn equally from all supplies installed in the system. If service from one power supply is interrupted, the system power demand shifts automatically to the remaining active supplies. If the combined output of the remaining supplies satisfies the system's requirements, the machine continues to operate with no interruption of service. With a hot standby or "n+1" power supply installed, the system can continue operating while a replacement power supply is installed. If power demands exceed the output of the active supplies, the system automatically notifies the console and suspends operation.

The base server includes one power supply that provides sufficient power for maximum memory, ten PCI cards, four internal disks, an optional tape drive, and up to three CPU modules. When either a fourth CPU or more than four internal disks are required, a second power supply must be installed.

Environmental Monitoring and Control (EM&C) System

The environmental monitoring and control system of the Ultra Enterprise 450 continuously monitors temperatures at several critical locations throughout the machine. Readings from thermal sensors provide input to the server's airflow management system, which automatically adjusts fan speeds as necessary to keep component operating temperatures within acceptable ranges. If measured temperatures exceed safe operating limits and fans are already operating at maximum speed, the system automatically notifies the console and suspends operation.

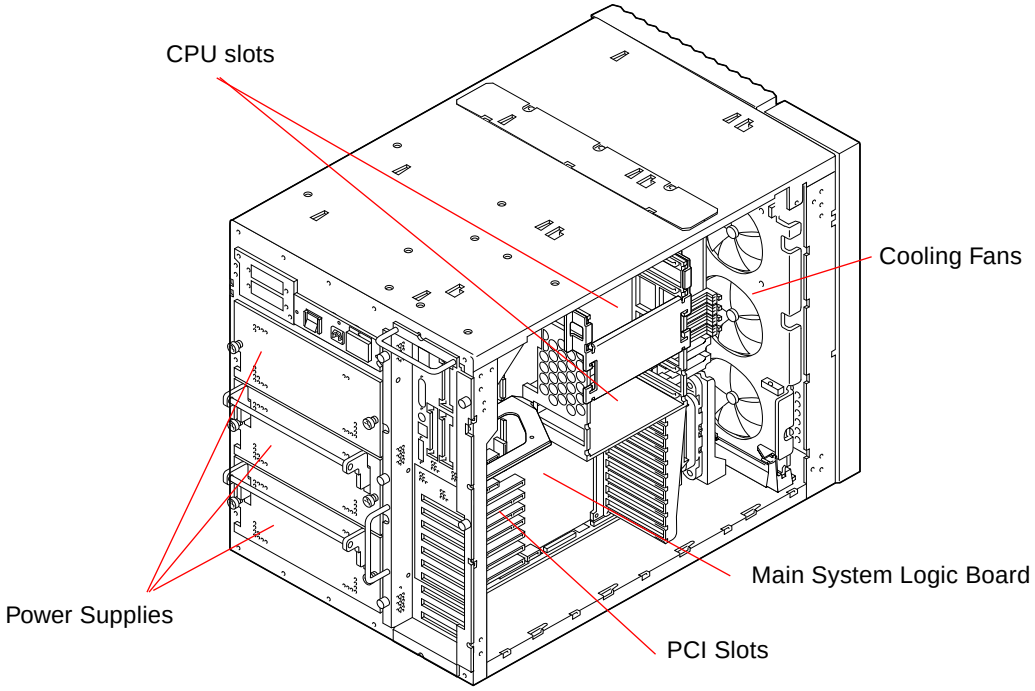


Figure 4. Ultra Enterprise 450, Rear Cut-away View

System Enclosure and Mechanical Specifications

The Ultra Enterprise 450 system is housed in a deskside tower enclosure that measures 22.87-inches high x 17.64-inches wide x 27.4-inches deep (581mm x 448mm x 696mm). The system chassis is mounted on four swivel casters that lock to provide system stability. Depending on the number and type of options installed, the system weighs between 120 pounds and 205 pounds.

Access to operator controls, all internal disk drives, and removable media drives is provided through two hinged doors on the front of the system. The disk bay door has a key lock for added system security. All front panel status indicator LEDs are visible through windows in the media bay door.

System Enclosure and Mechanical Specifications *(cont.)*

Power supplies and the main power switch are easily accessible from the rear of the chassis for serviceability, and all three power supplies may be secured in place by a removable locking device for additional peace of mind. Each power supply has status indicator lights visible from the rear of the system showing power-on and fault conditions.

Internal service access to the system requires simply unlocking and lifting off the server's left and right cover panels. CPU modules, memory DIMMs, and PCI option cards can be installed or removed easily through the left side of the machine. The main system board, which is oriented vertically from front-to-back, can be removed or installed easily through the rear of the system.

Airflow through the system is front-to-back, allowing the system to be rack-mounted in any standard 19-inch EIA rack (minimum 30-inch depth required). Cooling is provided by two slide-mounted fan tray assemblies. One cools the system- board electronic components while the other cools the disk drives and power supplies. Each is easily removable through the side of the system.

System Rack Mounting Kit

The Ultra Enterprise 450 is designed to be rack-mounted in its deskside tower configuration. The optional rack-mounting kit, which consists of a depth-adjustable, slide-mounted shelf and retaining brackets, can be installed in any EIA 19-inch-wide rack with:

- front and rear vertical mounting rail flanges between 28.5 and 34.875 inches apart
- standard front- and rear-facing mounting flanges
- at least 24 inches of available vertical mounting space
- sufficient load-bearing capacity

The system is simply placed on the shelf and secured in position with the brackets supplied in the kit. Because of the weight of the system, racks must be either bolted to the floor or must be equipped with stabilizer legs to prevent rack tipping when the system is pulled out for servicing.

Ultra™ Enterprise™ 450 System Management

Solaris™ Operating Environment

The Ultra™ Enterprise™ 450 offers customers the reliability, performance, scalability, and interoperability of Sun's industry leading Solaris™ operating environment. Customers who plan to continue running Solaris 2.5.1 on their existing Sun™ servers and desktop systems can easily integrate the Ultra Enterprise 450 into their environments by installing the system with the Solaris 2.5.1: Hardware 4/97 (or later). Ultra Enterprise 450 customers who are ready for the latest Solaris release will be able to take full advantage of all the powerful new server features added to Solaris 2.6 with this system. Ultra Enterprise 450 customers will be especially interested in the new installation and administration features, intranet and Internet capabilities, and desktop services for PCs, Macintoshes, UNIX® workstations, and Java™ NCs added to this new Solaris release.

Key Workgroup Server Features in Solaris 2.5.1

Ease of Installation and Administration	**Reliability/ Serviceability**	**Web Features**	**PC Connectivity**
Bundled with Solaris 2.5.1			
Solstice™ AdminSuite™	Solstice™ SyMON™		
Solstice™ DiskSuite™	SunVTS™		
Solstice™ Backup™ (single server)			
Available Separately			
Solstice™ AutoClient™		Solstice™ Internet Mail Server™	Syntax TotalNET
			Solstice™ NFS™ Client™

Key Workgroup Server Features Available With Solaris 2.6

Ease of Installation and Administration	**Reliability/ Serviceability**	**Web/Java™ Features**	**PC Connectivity**
Solaris™ Web Start™	ShowMe™ How™	Sun™ WebServer™	TotalNET (server plus 1 client)
Solstice AdminSuite	Solstice SyMON	HotJava™ Web Browser	Solstice NFS Client (1 client)
Solstice AutoClient (server plus 500 clients)	SunVTS	Java Virtual Machine	
Solstice DiskSuite		Simple Key Management for IP (SKIP)	
Solstice Backup (single server)		Dynamic Host Configuration Protocol (DHCP)	
		WebNFS™	
		PPP	
		Solstice Internet Mail Server (30-day Try and Buy only)	

Solaris Server Features and Benefits

Installation and Administration

• Features	• Benefits
– Solaris Web Start, part of Solaris 2.6, enables fast, easy network-based installation of the Solaris operating environment	– Eases and speeds the installation of Solaris on hosts and clients
– Includes Solstice AdminSuite, which provides a consistent, easy-to-use, graphical interface for common system administration functions. Includes a user manager for managing user accounts, a database manager for manipulating Solaris administration data, a host manager for connecting client systems to the network, a software manager for controlling installation of Solaris software packages, a serial port manager for managing serial ports remotely, and a print manager for network printing	– Eases system administration
– Includes AnswerBook™ for on-line network access to all Sun manuals, including browse and network print capability	– Speeds access to information, reduces cost
– Solstice™ SunNet Manager™ enables administration, monitoring, and troubleshooting of LANs and WANs	– Remote monitoring and control of networks lowers costs, increases uptime
– Third-party network and system management tools provide administration, monitoring, and troubleshooting tools for distributed systems.	– Users have a choice of network management solutions

Solaris Server Features and Benefits *(cont.)*

Compatibility

• Features	• Benefits
– The Ultra Enterprise 450 runs Sun's powerful and dependable Solaris network operating system and is 100 percent binary compatible with all software that runs on Sun's Ultra Enterprise 3000–6000 server family.	– Runs over 12,000 of the most extensively tested, highest quality software packages available today for both commercial and technical applications.
– Solaris is binary-compatible across all SPARC™ platforms, from desktops to enterprise servers	– Allows customers to deploy systems with confidence, knowing their applications can grow and their investment in network technology, software, and training will be protected
– Solaris is supported on SPARC, x86, and PowerPC platforms	– Makes it easy to deploy applications developed on SPARC platforms on other platforms

Performance and Scalability

• Features	• Benefits
– Outstanding performance and functionality in a variety of application areas, including database, networking, groupware, and multiuser business applications	– Provides maximum productivity for individuals and workgroups
– Highly scalable symmetric multiprocessing (SMP)	– Accelerates application throughput by distributing tasks among multiple processors (MP) – Delivers exceptional MP system price/performance and investment protection
– Multi-threading	– Enables a single application to be partitioned into independent components that can be executed simultaneously, reducing response time and increasing throughput

Solaris Server Features and Benefits *(cont.)*

Reliability

- **Features**
  - Proven and reliable network operating system
- **Benefits**
  - Maximum uptime for running business-critical applications

Low-Cost Data Management and Backup

- **Features**
  - Solstice DiskSuite provides data redundancy and enhanced disk system performance using RAID technology
  - Journaling File System improves performance of directory operations and reduces file system check times during system restarts
  - Solstice Backup automates network backup, recovery, and media management
- **Benefits**
  - Increases data availability and speeds system throughput
  - Enhances system throughput and increases system availability
  - Simplifies data administration, improves data security and availability

Global Networking and Resource Sharing

- **Features**
  - Connectivity for TCP/IP, NFS™, NetWare, IPX™/SPX, LAN Manager, and AppleTalk
  - NFS
- **Benefits**
  - Ensures complete corporate-wide connectivity and integration
  - Provides easy transparent network access to remote file systems, applications, and data on heterogeneous computer systems

Security

- **Features**
  - Simple Key Management for IP is a standard protocol that provides privacy and authentication services for data over the network
- **Benefits**
  - Allows for secure communications over the Internet or intranet, without requiring any changes to the application

Solaris Server Features and Benefits *(cont.)*

Electronic Mail

• Features	• Benefits
– Solstice Internet Mail Server, a high performance, Internet-standard mail server that supports diverse types of e-mail clients from a single mail server.	– Provides fast e-mail response, scalability to support large numbers of users and large quantities of data

Internet Services

• Features	• Benefits
– WebNFS is a robust and scalable file system that enables users to quickly access and share files over the Web	– Enables users to quickly access and share files over the Web
– Dynamic Host Configuration Protocol (DHCP) allows administrators to easily add clients to the intranet by dynamically assigning IP addresses	– Eliminates need for administrator to assign IP addresses manually to each client
– HotJava Browser provides an easy-to-use, customizable user interface	– Provides easy-to-use interface for installing software, performing web-based administration tasks, and accessing data over the Web
– Sun WebServer	– Provides fast response for accessing data over the Internet or when performing web-based administration tasks

PC Integration and PC Interoperability

Sun's strategy is to support any client, including PCs, Macintoshes, UNIX workstations, and Java Network Computers. As PCs are by far the most common desktop, Sun is putting a lot of focus on PC services and PC interoperability.

To achieve this strategy, Sun is focusing on open industry standards. These are evolving Internet standards for all network services, including file, print, directory, security, messaging, and objects. In addition, Sun will provide or work with ISVs to provide a bridge to popular standards such as Microsoft's standards.

New PC Interoperability Features in Solaris 2.6

File/Print	
• TotalNET	This server-side software allows a Sun server to provide file and print services to PCs running LAN Manager or Novell NetWare and Macintoshes running Appletalk. Nothing is required on the client.
• Solstice NFS Client	This client software allows a PC running Microsoft Windows 95 or Microsoft Windows NT to use NFS file and print services on a network without having to install and pay for other network applications and functionality that the average user does not require. It provides higher performance and more robust services than TotalNET, but requires changes to the client.
E-mail	
• Solstice Internet Mail Server (SIMS)	SIMS supports IMAP4 and POP3. Most PC e-mail solutions today, including Microsoft Exchange, support POP3. Eventually, the industry will move to IMAP4, which is the Internet mail standard.
• Solstice NFS Client	This client software allows a PC running Microsoft Windows 95 or Microsoft Windows NT to use NFS file and print services. It provides higher performance and more robust services than TotalNET, but requires changes to the client.

Future Interoperability Features

Management	
• Manage PC clients	Sun's ISVs, including Computer Associates (CA) and Tivoli, offer best-of-breed software tools for managing PC clients. In addition, once these are enhanced with Java, these products can be integrated into our Solstice™ family of tools. Over 40 management ISVs, including CA and Tivoli, will enhance their applications with JMAPI.
• Manage from anywhere, manage from a PC	Sun's Solstice tools are being enhanced with Java and will soon conform to the Java Management API (JMAPI). That means they will be managed over the Web from any console that has a Java-enabled browser.
Directory	
• NDS	Sun has announced an alliance with Novell to port their directory service, NDS, to Solaris. This will be available at the beginning of next year.
• LDAP	Also, Sun will be supporting LDAP, an industry standard protocol for interoperating with Microsoft Windows NT's future directory service.

Ultra™ Enterprise™ 450 Ordering Information

Ordering the Ultra Enterprise 450

The Ultra™ Enterprise™ 450 is a configure-to-order product. All customer-specified system components and configurable options appearing on a sales order on the same line item with a base system will be installed in that system at the factory for no additional charge.

As with other Sun configure-to-order systems, sales orders for the Enterprise 450 specify:

- The Family Part Number (A25) as the first entry in a line item
- A base system
- Required system components: Country kit or power cord
- Internal (configured) options: memory, storage expansion kits, I/O cards, and so on.
- External (non-configured) options (these are entered as additional line items)

Base Systems

Order Number	Title and Description
A25-UDB1-9S-128CD	Ultra Enterprise 450 Server system in deskside tower enclosure includes: • 250MHz UltraSPARC-II processor with 1-MB E-cache • 128 MB of memory (4 x 32-MB DIMMs) • 4.2-GB low profile UltraSCSI disk drive • 3.5-inch floppy disk • SunCD™12 • Fast/Wide SCSI port (68-pin SCSI connector) • 10/100 Ethernet (with both RJ45 and MII connectors) • Two serial ports (via one DB25 connector) • Parallel port (DB25 connector) • One 560 W hot-swap power supply • Solaris™ Server License • 3-year, second-day, on-site hardware warranty • 90-day software SunSpectrum^{SM} warranty
A25-UDB1-9S-256CD	Same as A25-UDB1-9S-128CD, except includes 256 MB of memory (4 x 64-MB DIMMs)
A25-UDB1-9S-512CD	Same as A25-UDB1-9S-128CD, except includes 512 MB of memory (4 x 128-MB DIMMs)
A25-UEC1-9S-128CD	Same as A25-UDB1-9S-128CD, except includes 300-MHz processor with 2-MB E-cache
A25-UEC1-9S-256CD	Same as A25-UDB1-9S-256CD, except includes 300-MHz processor with 2-MB E-cache
A25-UEC1-9S-512CD	Same as A25-UDB1-9S-512CD, except includes 300-MHz processor with 2-MB E-cache

Ordering Process for Systems and Factory-Installed Components

Follow the steps listed below to prepare a complete and valid sales order. Steps 1 to 3, 6, and 10 are required. Step 5 is required if more than four internal disks are ordered. Step 9 is required if four CPUs or more than four internal disks are ordered. Steps 4, 7, 8, and 11 to 13 are optional.

Step 1: Enter the Family Part Number (required)

Specify:	**A25**	Ultra Enterprise 450 Server

Step 2: Order Base Package (required)

Order:	**A25-UDB1-9S-128CD**	Enterprise 450 Server, 250MHz, 128-MB memory, 4.2-GB
	A25-UDB1-9S-256CD	Enterprise 450 Server, 250MHz, 256-MB memory, 4.2-GB
	A25-UDB1-9S-512CD	Enterprise 450 Server, 250MHz, 512-MB memory, 4.2-GB
	A25-UEC1-9S-128CD	Enterprise 450 Server, 300MHz, 128-MB memory, 4.2-GB
	A25-UEC1-9S-256CD	Enterprise 450 Server, 300MHz, 256-MB memory, 4.2-GB
	A25-UEC1-9S-512CD	Enterprise 450 Server, 300MHz, 512-MB memory, 4.2-GB

Step 3: Order CPU Modules (optional)

Order one to three:	**2230A**	250-MHz UltraSPARC™-II CPU module with 1-MB E-cache
	2240A	300-MHz UltraSPARC-II CPU module with 2-MB E-cache

Notes:

- One, two, or three CPUs can be added
- All CPUs ordered for one system must be the same part number and must match the CPU in the base system
- If four CPUs are to be installed, a second power supply must be ordered

Step 4: Order Additional Memory (optional)

Order two, four, or six:	**7002A**	64-MB ECC memory (2 x 32-MB DIMMs); use with E450-128
	7003A	128-MB ECC memory (2 x 64-MB DIMMs); use with E450-256
	7004A	256-MB ECC memory (2 x 128-MB DIMMs); use with E450-512

Notes:

- Base systems are preconfigured with four identical memory DIMMs
- Twelve memory expansion DIMM slots are available
- Maximum memory configuration: 16 DIMMs (four groups of four)
- Each memory option includes two DIMMs
- DIMMs must be added in matched groups of four (e.g. two, four, or six x 7002A)
- Order memory options in pairs
- For best performance, systems should be configured with 8 or 16 identical DIMMs (add two or six identical memory options)

Ordering Process for Systems and Factory-Installed Components *(cont.)*

Step 5: Order Internal Storage Expansion Option (may be required)

Order one or two:	**6600A**	Eight-bay Storage Expansion Option

Notes:
- One is required in order to install 5 to 12 internal disk drives
- Two are required in order to install 13 to 20 internal disk drives
- Maximum of two per system
- Each 6600A uses one PCI slot (either 32- or 64-bit)
- A second power supply is a prerequisite for installing a 6600A

Step 6: Order Internal Disks (optional)

Order:	**5214A**	4.2-GB, 7200-rpm hot-swap UltraSCSI disk drive

Notes:
- Internal disks may be added individually
- Maximum configuration: 20 internal disks (one is included in each base system)
- One 6600A eight-bay Storage Expansion Option must be installed to support 5 to 12 disks
- Two 6600A eight-bay Storage Expansion Options must be installed to support 13 to 20 disks
- A second power supply is required if a 6600A is installed

Step 7: Order Internal Removable Storage Device (optional)

Order one internal removable media device:	**6286A**	12–24-GB 4mm DDS-3 Tape Drive
	6213A	7–14-GB 8mm Tape Drive
	6107A	4–8-GB SLR Tape Drive

Notes:
- Maximum of one internal 5.25-inch, half-height tape drive may be installed

Step 8: Order PCI Host Adapters and Network Interface Cards (optional)

Select from:	**6540A**	Dual-channel Single-ended UltraSCSI Host Adapter, PCI
	6541A	Dual-channel Differential UltraSCSI Host Adapter, PCI
	1032A	SunSwift™ Adapter (UltraSCSI plus FastEthernet), PCI
	1033A	SunFastEthernet™ controller, PCI
	1034A	Sun QFE/P Sun™ Quad FastEthernet™ controller, PCI
	1035A	SunFDDI™/P single-attach adapter, PCI
	1036A	SunFDDI/P dual-attach adapter, PCI
	1039A	Sun TRI/P Token Ring Interface, PCI
	1040A	Sun HSI™/P High Speed Serial Interface, PCI
	1041A	Sun SAI/P Multiport Serial Interface, PCI
	1044A	Sun GEM/P Gigabit Ethernet controller, PCI
	3660A	PGX Graphics Card, PCI

Notes:
- Maximum configuration: Ten PCI cards
- See *Ultra Enterprise 450 Options* table for maximum number of each card supported

Ordering Process for Systems and Factory-Installed Components *(cont.)*

Step 9: Order Additional Power Supplies (may be required)

Order one or two: **9682A** 560 W Universal Power Supply

Notes:
- Maximum configuration: three power supplies (one is standard)
- A fully loaded system will operate on two power supplies. The third power supply provides redundancy for greater system availability
- A second power supply is required if four CPUs or more than four internal disks are ordered

10: Order Power Cord/Country Kit (required)

Order: **X3xxL** Power Cord

X35xxA Type-5 Country Kit

Notes:
- Order an X3xxL power cord if the system will not require a local graphics console.
- Order an X35xxA Country Kit if the system will host a local graphics console.

Step 11: Order External Disk Storage Options (optional)

Order: See options list.

Notes:
- One SPARCstorage™ MultiPack or up to four SPARCstorage UniPack disks may be attached to the system's Fast/Wide SCSI port
- Additional SCSI storage devices may be supported by PCI SCSI host adapters

Step 12: Order External Tape Options (optional)

Order: See options list.

Notes:
- Up to four external SCSI tape devices may be attached to the system's Fast/Wide SCSI port
- Additional SCSI tape devices may be supported by PCI SCSI host adapters

Step 13: Order Other Options (optional)

Order: See options list.

Ultra Enterprise 450 Ordering Information *(cont.)*

Ordering Process for Systems and Factory-Installed Components *(cont.)*

Typical Ultra Enterprise 450 Configuration:

Ultra Enterprise 450 with two 300-MHz UltraSPARC-2 processors, 512-MB main memory, internal SunCD 12, floppy, 12 internal disk bays with 33.6-GB internal disk storage, internal 7–14-GB 8mm tape drive, local color graphics console with 17-inch monitor

Quantity	Order Number	Description
1	A25	Enterprise 450 server family
1	A25-UEC1-9S-256CD	Enterprise 450 server, 300-MHz CPU, 256-MB memory, 4.2-GB disk, SunCD 12, floppy, 560 W power supply, Solaris Server license
1	2240A	UltraSPARC-2 CPU module, 300 MHz, 2-MB external cache
2	7003A	128-MB memory (2 x 64-MB SIMMs)
1	6600A	Eight-bay storage expansion option
7	5214A	4.2-GB internal hot-plug disk drive, 7200-rpm, 1-inch high
1	6213A	Internal 14-GB 8mm tape drive
1	3660A	PGX color graphics frame buffer option
1	X7103A	17-inch entry color monitor
1	X3500A	Type-5 Country Kit, U.S.

Ultra Enterprise 450 Ordering Information *(cont.)*

Ordering Process for Systems and Factory-Installed Components *(cont.)*

Maximum Ultra Enterprise 450 Configuration:

Ultra Enterprise 450 with four 300-MHz UltraSPARC-2 CPUs, 2-GB main memory, 20 internal disk bays, 84-GB disk storage, internal SunCD 12, floppy, 7–14-GB 8mm tape drive, fully redundant power supplies, local graphics console with 17-inch monitor, and cabinet with rack mounting kit, seven available PCI slots to support network cards and external storage options

Quantity	Order Number	Description
1	A25	Enterprise 450 server family
1	A25-UEC1-9S-512CD	Enterprise 450 server, 300-MHz CPU, 512-MB memory, 4.2-GB disk, SunCD 12, floppy, 560 W power supply, Solaris Server license
3	2240A	UltraSPARC-2 CPU module, 300-MHz, 2-MB external cache
6	7004A	256-MB memory (2 x 128-MB SIMMs)
2	6600A	Eight-bay storage expansion option
19	5214A	4.2-GB internal hot plug disk drive, 7200-rpm, 1-inch high
1	6213A	Internal 14-GB 8mm tape drive
1	3660A	PGX graphics card, PCI
2	9682A	560 W power supply
1	X7103A	17-inch entry color monitor
1	X3500A	Type-5 Country Kit, U.S.
1	X956A	56-inch Enterprise expansion cabinet
1	X3800A	Power Cord for Enterprise expansion cabinet
1	X9690A	Enterprise 450 rack mounting kit

Ultra Enterprise 450 Options

Below is a partial list of options available for the Ultra Enterprise 450 system. Refer to the Sun Price Book for complete option listings, configuration notes, and ordering information. When no maximum number is listed, consult the configuration information for that option.

Part Number	Option description	Maximum number supported	Comments
CPUs			
(X)2230A	250-MHz UltraSPARC-II CPU module with 1-MB E-cache	3	
(X)2240A	300-MHz UltraSPARC-II CPU module with 2-MB E-cache	3	
Memory			
(X)7002A	64-MB 60-ns memory expansion (2 x 32 MB DIMMs)	6	See memory configuration requirements
(X)7003A	128-MB 60-ns memory expansion (2 x 64 MB DIMMs)	6	
(X)7004A	256-MB 60-ns memory expansion (2 x 128 MB DIMMs)	6	
Intern. Storage Expansion Kit			
(X)6600A	Eight-bay internal storage expansion option	2	Requires second power supply
Internal Storage Devices			
(X)5214A	4.2-GB, 7200-rpm 3.5-inch low-profile UltraSCSI disk drive	19	
(X)6286A	12–24-GB 4mm DDS-3 tape drive	1	
(X)6213A	7–14-GB 8mm tape drive	1	
(X)6107A	4–8-GB SLR tape drive	1	
External Storage Interfaces			
(X)1032A	SunSwift UltraSCSI plus FastEthernet controller, PCI	10	
(X)6540A	Dual-channel single-ended UltraSCSI Host Adapter, PCI	10	
(X)6541A	Dual-channel differential UltraSCSI Host Adapter, PCI	10	
External Disk Storage Devices			
X5151A	SPARCstorage UniPack 2.1-GB, 7200-rpm disk drive	16	
X5209A	SPARCstorage UniPack 4.2-GB, 7200-rpm disk drive	16	
X5253A	SPARCstorage UniPack 9.1-GB, 7200-rpm disk drive	16	
X5504A	SPARCstorage MultiPack-6, 2 x 9.1-GB, 7200-rpm disk drives	40	
X5505A	SPARCstorage MultiPack-6, 4 x 9.1-GB, 7200-rpm disk drives	40	
X5506A	SPARCstorage MultiPack-6, 6 x 9.1-GB, 7200-rpm disk drives	40	
X5251A	9.1-GB drive for SPARCstorage MultiPack-6	240	
X6527A	SPARCstorage MultiPack 2, 2 x 9.1-GB, SCA disk drives	20	
X6528A	SPARCstorage MultiPack 2, 4 x 9.1-GB, SCA disk drives	20	
X6529A	SPARCstorage MultiPack 2, 6 x 9.1-GB, SCA disk drives	20	

Ultra Enterprise 450 Options *(cont.)*

Part Number	Option description	Maximum number supported	Comments
External Disk Storage Devices (cont.)			
X5511A	SPARCstorage MultiPack-12, 2 x 2.1-GB, 7200-rpm disk drives	20	
X5512A	SPARCstorage MultiPack-12, 6 x 2.1-GB, 7200-rpm disk drives	20	
X5513A	SPARCstorage MultiPack-12, 12 x 2.1-GB, 7200-rpm disk drives	20	
X5514A	SPARCstorage MultiPack-12, 2 x 4.2-GB, 7200-rpm disk drives	20	
X5515A	SPARCstorage MultiPack-12, 6 x 4.2-GB, 7200-rpm disk drives	20	
X5516A	SPARCstorage MultiPack-12, 12 x 4.2-GB, 7200-rpm disk drives	20	
X5153A	2.1-GB drive for SPARCstorage MultiPack-12	240	
X5214A	4.2-GB drive for SPARCstorage MultiPack-12	240	
X6503A	3 x 4.2-GB SPARCstorage RSM	20	
X6504A	7 x 4.2-GB SPARCstorage RSM	20	
X6506A	4.2-GB drive module for SPARCstorage RSM	140	
X6514A	3 x 9.1-GB SPARCstorage RSM	20	
X6515A	7 x 9.1-GB SPARCstorage RSM	20	
X6516A	9.1-GB drive module for SPARCstorage RSM	140	
Ext. Removable Media			
DDS-2			
X6261A	4–8-GB 4mm DDS-2 tape UniPack	4	
X6263A	4–8-GB 4mm DDS-2 tape FlexiPack	4	
X6265A	4–8-GB 4mm DDS-2 tape second drive for FlexiPack	4	
DDS-3			
X6280A	12–24-GB DDS-3 tape UniPack	4	
X6284A	12–24-GB 4mm DDS-3 tape FlexiPack	4	
X6286A	12–24-GB 4mm DDS-3 tape second drive for FlexiPack	4	
X6290A	72–144-GB 4mm DDS-3 tape FlexiPack, autoloader	4	
X6292A	72–144-GB 4mm DDS-3 tape autoloader with multi-tape tray	4	
X6293A	72–144-GB 4mm DDS-3 tape autoloader for multi-tape tray	12	

Ultra Enterprise 450 Options *(cont.)*

Part Number	Option description	Maximum number supported	Comments
Ext. Removable Media (cont.)			
8mm			
X6208A	7–14-GB 8mm tape UniPack	4	
X6210A	7–14-GB 8mm tape FlexiPack	4	
X6212A	7–14-GB 8mm tape second drive for FlexiPack	4	
X6227A	140-GB SPARCstorage Library Model 8/140, tower, one drive	4	
X6228A	140-GB SPARCstorage Library Model 8/140, rack-mount, one drive	4	
X6229A	7–14-GB 8mm tape second drive for SSL 8/140	4	
X6230A	20–40-GB 8mm tape UniPack	4	
X6232A	20–40-GB 8mm tape FlexiPack	4	
X6236A	20–40-GB 8mm tape second drive for FlexiPack	4	
X6225A	400-GB SPARCstorage Library Model 8/400, stackable unit	4	
X6226A	400-GB SPARCstorage Library Model 8/400, rack-mount	4	
DLT™			
X6056A	20–40-GB SPARCstorage DLT4000 tape with multi-tape tray	4	
X6055A	20–40-GB SPARCstorage DLT4000 tape for multi-tape tray	12	
X6057A	20–40-GB SPARCstorage DLT4000 tape, FlexiPack	4	
X6071A	140–280-GB SPARCstorage DLT4700 tape autoloader, desktop	4	
X6060A	35–70-GB SPARCstorage DLT7000 tape, FlexiPack	4	
X6063A	35–70-GB SPARCstorage DLT7000 tape drive for ETL	8	
X6073A	1.8-TB Enterprise Tape Library™ (SunETL™) 4/1800 with 2 drives	4	
X6074A	1.8-TB Enterprise Tape Library ETL 4/1800 with 4 drives	4	
X6108A	4–8-GB SLR tape UniPack	4	
X6110A	4–8-GB SLR tape FlexiPack	4	
X6101A	2.5-GB QIC tape UniPack	4	
X6157A	SunCD 12 UniPack	4	
X6159A	SunCD 12 FlexiPack	4	
X6161A	SunCD 12 for FlexiPack	4	
Network Interfaces			
(X)1032A	SunSwift, PCI (FastEthernet plus UltraSCSI)	10	
(X)1033A	SunFastEthernet, PCI	10	
(X)1034A	Sun QFE/P QuadFastEthernet, PCI	4	
(X)1035A	SunFDDI/P, single-attach, PCI	4	
(X)1036A	SunFDDI/P, dual-attach, PCI	4	
(X)1039A	Sun TRI/P Token Ring Interface, PCI	4	
(X)1040A	Sun HSI/P High Speed Serial Interface, PCI	4	
(X)1041A	Sun SAI/P 8-port Serial Interface, PCI	4	
(X)1044A	Sun GEM/P Gigabit Ethernet, PCI	3	

Ultra Enterprise 450 Options *(cont.)*

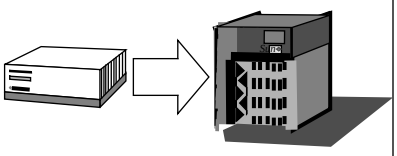
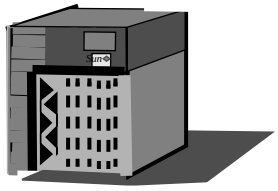
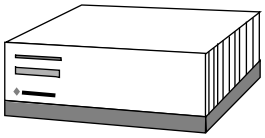
Part Number	Option description	Maximum number supported	Comments
Other Options			
(X)9682A	560 W hot-swap power supply	2	
(X)3660A	PGX PCI graphics card	2	
X7103A	17-inch entry color monitor	2	
X3872A	Video connector adapter, HD15 female to 13W3 male	2	
X267A	20-inch premium color monitor	2	
X9690A	Enterprise 450 rack mounting kit	1	
X956A	56-inch Enterprise expansion cabinet	1	
X3800A	Power cord for EE Cabinet, U.S.	1	
X3848A	Power cord for EE Cabinet, International	1	
X9602A	Enterprise cabinet floor brackets	1	
X981A	AUI adapter cable	1	
X985A	Serial port Y splitter cable	1	
X975A	IBM-compatible parallel port cable	1	
X976A	Centronics-compatible parallel port cable	1	
X3830A	4-meter SCSI cable; VHDC to 68-pin SCSI; for use with 6541A	*	
X3831A	10-meter SCSI cable; VHDC to 68-pin SCSII; for use with 6541A	*	
#300-1322	DC/DC Converter	3	
SOL-E450-D	E450 Solaris media kit supplement for Solaris 2.5.1. APR97		
	* *Cables are supported to the number required.*		

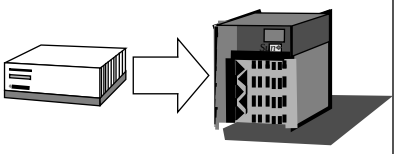
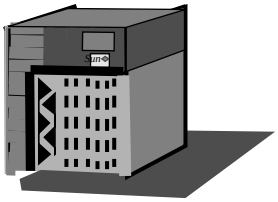
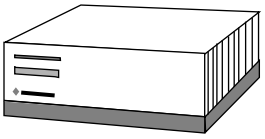
Ultra™ Enterprise™ 450 Upgrades

Key Messages

Sun offers customers a variety of flexible upgrade paths to the most popular Sun™ systems. Customers can choose among full-system, non-full system, CPU and memory upgrades. To protect customers' investments, Sun upgrades allow customers to carry as many components forward as possible. Existing investments in non-Sun hardware can be preserved by upgrading to Sun systems through competitive upgrades.

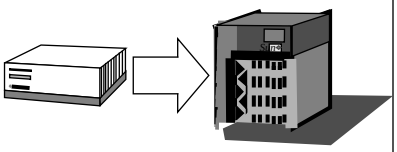
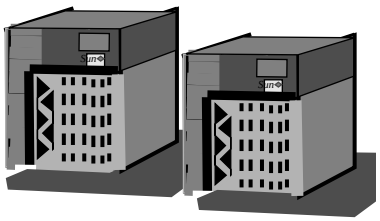
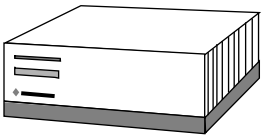
System Upgrades

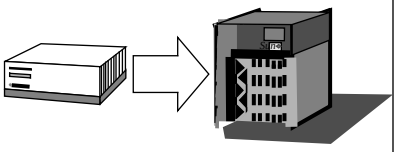
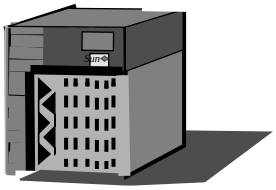
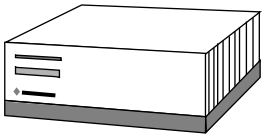
UG14-5UNC-9S-000ND	Receive	Return
 Any Ultra™ Enterprise™ 2 Model 1300 or 2300 to Ultra Enterprise 450 server.	 Ultra Enterprise 450 server chassis, SunCD™ 12, floppy, 2 DC/DC converters, 4 disk brackets. Assume CPU, disk, and memory are migrated	 Ultra Enterprise 2 Model 1300 or Model 2300 chassis and CD-ROM

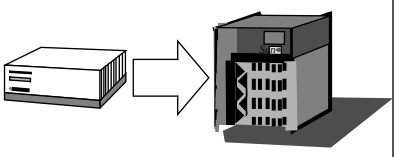
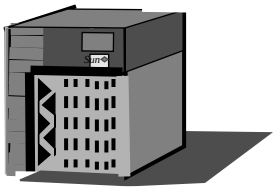
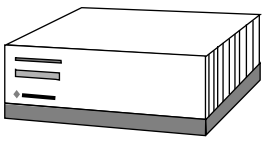
UG14-5UDB19S-000ND	Receive	Return
 Any UltraSPARC™ Server with 7200-rpm, 1-inch high, 2.1-GB or 4.2-GB disk drives to Ultra Enterprise 450 Server	 Ultra Enterprise 450 server chassis, one 250-MHz CPU, SunCD 12, floppy, 4 disk brackets. Assume disk and memory are migrated	 UltraSPARC server chassis, CPU, and CD-ROM

Ultra Enterprise 450 Upgrades *(cont.)*

System Upgrades *(cont.)*

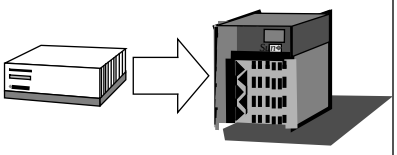
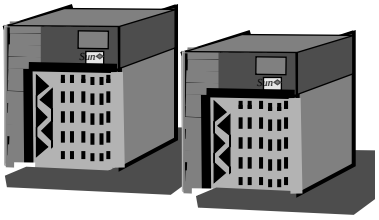
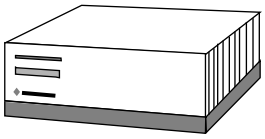
UG14-5UEC19S-000ND	Receive	Return
 Any UltraSPARCServer with 7200-rpm, 1-inch high, 2.1-GB or 4.2-GB disk drives to Ultra Enterprise 450 Server	 Ultra Enterprise 450 server chassis, one 300-MHz CPU, SunCD 12, floppy, 4 disk brackets. Assume disk and memory are migrated	 UltraSPARC server chassis, CPU, and CD-ROM

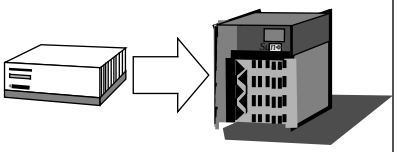
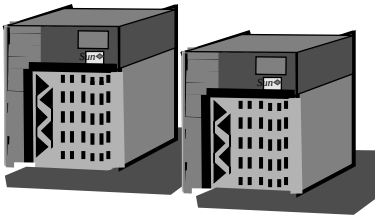
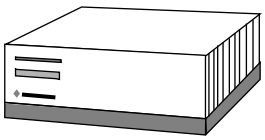
UG14-5UDB19S-000CD	Receive	Return
 Any UltraSPARC or SPARCserver™ 20 Server with 4 x 32-MB Memory SIMMS to Ultra Enterprise 450 Server	 Ultra Enterprise 450 server chassis, one250-MHz CPU, one 4.2-GB disk, SunCD 12, floppy. Assume memory is migrated	 UltraSPARC or SPARCserver 20 system including chassis, CPU, disk, and CD-ROM

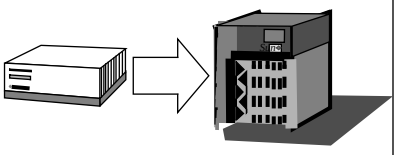
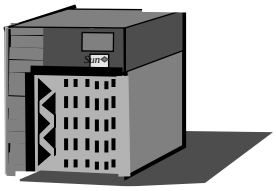
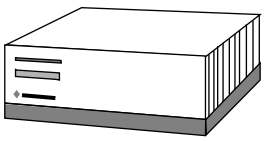
UG14-5UEC19S-000CD	Receive	Return
 Any UltraSPARC or SPARCserver 20 Server with 4 x 32-MB Memory SIMMS to Ultra Enterprise 450 Server	 Ultra Enterprise 450 server chassis, one 300-MHz CPU, one 4.2-GB disk, SunCD 12, floppy. Assume memory is migrated	 UltraSPARC or SPARCserver 20 system including chassis, CPU, disk, and CD-ROM

Ultra Enterprise 450 Upgrades *(cont.)*

System Upgrades *(cont.)*

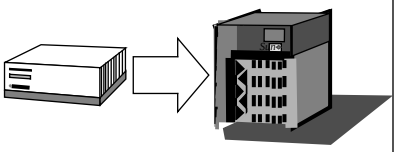
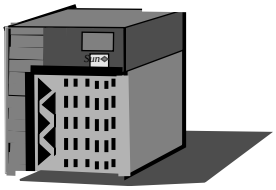
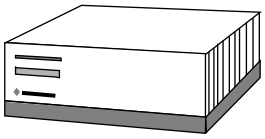
UG10-5UEC19S-128CD	Receive	Return
		
Any SPARCstation™ 10 or earlier Sun server to Ultra Enterprise 450 server	Ultra Enterprise 450 server chassis, one 300-MHz CPU, 128 MB (4 x 32 MB), one 4.2-GB disk, SunCD 12, and floppy	Complete SPARCstation10 or earlier Sun server including chassis, disk, and CD-ROM

UG10-5UDB19S-128CD	Receive	Return
		
Any SPARCstation10 or earlier Sun server to Ultra Enterprise 450 server	Ultra Enterprise 450 server chassis, one 250-MHz CPU, 128-MB (4 x32 MB), one 4.2-GB disk, SunCD 12, and floppy.	Complete SPARCstation10 or earlier Sun server system including chassis, disk, and CD-ROM

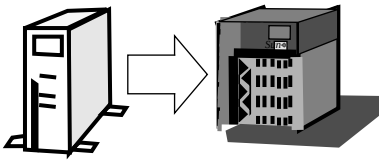
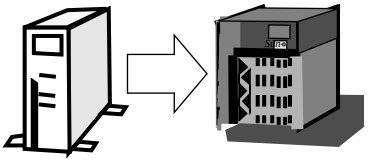
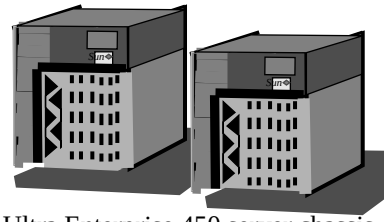
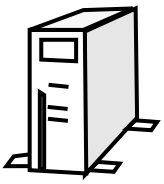
UG10-5UDB19S-256CD	Receive	Return
		
Any SPARCstation10 or earlier Sun server to Ultra Enterprise 450 server	Ultra Enterprise 450 server chassis, one 250-MHz CPU, 256 MB (4 x 64 MB), one 4.2-GB disk, SunCD 12, floppy.	Complete SPARCstation10 or earlier Sun server system including chassis, disk, and CD-ROM

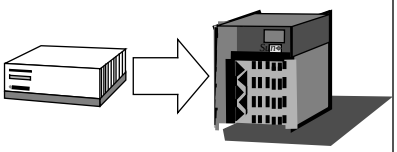
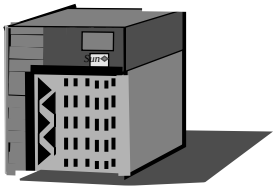
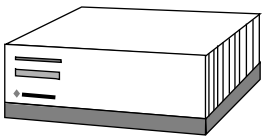
Ultra Enterprise 450 Upgrades *(cont.)*

System Upgrades *(cont.*

UG10-5UEC19S-256CD	Receive	Return
 Any SPARCstation10 or earlier Sun server to Ultra Enterprise 450 server	 Ultra Enterprise 450 server chassis, one 300-MHz CPU, 256 MB (4 x 64 MB), one 4.2-GB disk, SunCD 12, floppy	 Complete SPARCstation10 or earlier Sun server system including chassis, disk, and CD-ROM

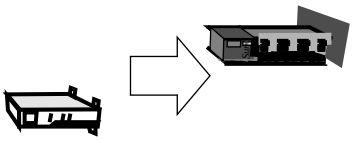
Competitive System Upgrades

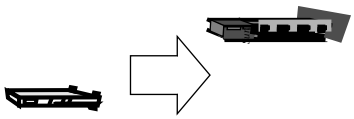
CU-5UDB1-9S-256CD	Receive	Return
  Any Category 2 or 3 competitive server to Ultra Enterprise 450 server	 Ultra Enterprise 450 server chassis, one 250-MHz CPU, 256 MB (4 x 64 MB), one 4.2-GB disk, SunCD 12, and floppy	 Any Category 2 or 3 competitive server system including chassis, disk, and CD-ROM

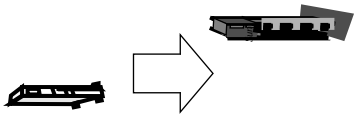
CU-5UEC1-9S-256CD	Receive	Return
 Any Category 2 or 3 competitive server to Ultra Enterprise 450 server	 Ultra Enterprise 450 server chassis, one 300-MHz CPU, 256 MB (4 x 64 MB), one 4.2-GB disk, SunCD 12, floppy	 Any Category 2 or 3 competitive server system including chassis, disk, and CD-ROM

Ultra Enterprise 450 Upgrades *(cont.)*

Module Upgrades

UG-MXXX-M300	Receive	Return
		
Any UltraSPARC CPU Module to 300-MHz UltraSPARC-II CPU Module with 2-MB E-cache and DC/DC Converter	300-MHz UltraSPARC-2 CPU module with 2-MB E-cache and DC/DC Converter	Any UltraSPARC CPU Module

UG-MEM32-MEM128	Receive	Return
		
Upgrade from 32 MB (2 x 16 MB Sun SIMMS) of memory to 128 MB (4 x 32 MB Sun DIMM Modules) of memory	128 MB (4 x 32 MB of Sun Memory DIMM modules) of memory	Any Sun memory SIMMS totaling 32 MB of memory

UG-MEM128-MEM512	Receive	Return
		
Upgrade from 128 MB of Sun memory to 512 MB (4 x 128 MB Sun DIMM modules) of memory	512 MB (4 x 128 MB Sun memory DIMM modules) of memory	Any Sun memory SIMMS totaling 128 MB of memory

Ordering Process for Full and Non-Full System Upgrades

The Ultra Enterprise 450 is a configure-to-order product. All required customer -specified system components and configurable options appearing on a customer's order on the same line item with a base system will be installed in that system at the factory for no additional charge.

As with other Sun configure-to-order systems, Sales Orders for Upgrading to the Ultra Enterprise 450 specify:

- The family part number as the first entry in a line item
- A full-system upgrade or non-full system upgrade
- Required system components—country kit or power cord
- Internal (configured) options—CPU, memory, disk, storage expansion kits, I/O cards, etc.
- External (non-configured) options

Ultra Enterprise 450 Non-Full System Upgrades

Non-full system upgrades require migration of Ultra Enterprise 450-compatible components from the Sun server being upgraded (i.e., 300-MHz UltraSPARC CPU modules; 7200-rpm, 1-inch high, 2.1-GB or 4.2-GB disk drives; 32 MB or greater memory DIMMS). Valid non-full system upgrade orders must specify the compatible components that are migrating via a form that can be obtained by sending an e-mail to e450_chassis_upgrade-ext@sun.com.

The following are Ultra Enterprise 450 non-full system upgrades:

Order Number	Title and Description
UG14-5UNC-9S-000ND **UG14-5UDB19S-000ND** **UG14-5UEC19S-000ND** **UG14-5UDB19S-000CD** **UG14-5UEC19S-000CD**	Tower system Non-full system upgrade to Ultra Enterprise 450 Server in deskside tower enclosure includes: • 3.5-inch floppy disk • SunCD 12 • Four internal 3.5-inch x 1-inch hot-swap UltraSCSI drive bays • Fast/Wide SCSI port • 10/100 Ethernet • One 560W hot swap power supply • Solaris™ Server License • 3-year, second-day, on-site hardware warranty • 90-day software SunSpectrum℠ warranty • Assumes CPU, disk, or memory is migrated or ordered. See the "System Upgrades" tables in this section for a detailed description by upgrade part number

Ordering Process for Full and Non-Full System Upgrades *(cont.)*

Ultra Enterprise 450 Full-System Upgrades

Order Number	Title and Description
UG10-5UDB19S-128CD **UG10-5UEC19S-128CD** **UG10-5UDB19S-256CD** **UG10-5UEC19S-256CD** **CU-5UDB1-9S-256CD** **CU-5UEC1-9S-256CD**	Ultra Enterprise 450 Server system in deskside tower enclosure includes: • 3.5-inch floppy disk • SunCD 12 • Four internal 3.5-inch x 1-inch hot-swap UltraSCSI drive bays • Fast/Wide SCSI port • 10/100 Ethernet • 560 W hot swap power supply • Solaris Server License • 3-year, second-day, on-site hardware warranty • 90-day software SunSpectrum warranty • 4.2-GB disk; CPU and memory included vary depending upon upgrade part number

To order:

Follow the steps listed below to prepare a complete and valid Sales Order.

Step 1: Enter the Family Part Number

Specify:	**UG-A25**	Ultra Enterprise 450 Server Upgrades

Step 2: Order Base Package

Order:	**UG14-5UNC-9S-000ND**	Ultra Enterprise 450 Server chassis only
	UG14-5UDB19S-000ND	Ultra Enterprise 450 Server, chassis, 250-MHz CPU only
	UG14-5UEC19S-000ND	Ultra Enterprise 450 Server, chassis, 300-MHz CPU only
	UG14-5UDB19S-000CD	Ultra Enterprise 450 Server, chassis, 250-MHz CPU, disk only
	UG14-5UEC19S-000CD	Ultra Enterprise 450 Server, chassis, 300-MHz CPU, disk only
	UG10-5UDB19S-128CD	Ultra Enterprise 450 Server system, 250-MHz, 128 MB, 4.2 GB
	UG10-5UEC19S-128CD	Ultra Enterprise 450 Server system, 300-MHz, 128 MB, 4.2 GB
	UG10-5UDB19S-256CD	Ultra Enterprise 450 Server system, 250-MHz, 256 MB, 4.2 GB
	UG10-5UEC19S-256CD	Ultra Enterprise 450 Server system, 300-MHz, 256 MB, 4.2 GB
	CU-5UDB19S-256CD	Ultra Enterprise 450 Server system, 250-MHz, 256 MB, 4.2 GB
	CU-5UEC19S-256CD	Ultra Enterprise 450 Server system, 300-MHz, 256 MB, 4.2 GB

Ordering Process for Full and Non-Full System Upgrades *(cont.)*

Ultra Enterprise 450 Full System Upgrades *(cont.)*

Step 3: Order CPU (optional)

Order one to three:	**2230A**	250-MHz UltraSPARC-II CPU module with 1-MB E-cache
	2240A	300-MHz UltraSPARC-II CPU module with 2-MB E-cache

Notes:
- 1–4 CPUs can be installed in a system
- All CPUs ordered for one system must be the same part number and must match the CPU that is being migrated or in the base system
- A second power supply must be ordered if 4 CPUs are to be installed

Step 4: Order Memory (optional))

Order two, four, or six:	**7002A**	64-MB ECC memory (2 x 32-MB DIMMs)
	7003A	28-MB ECC memory (2 x 64-MB DIMMs)
	7004A	256-MB ECC memory (2 x 128-MB DIMMs)

Notes:
- Memory is configured with 4 identical memory DIMMs)
- Maximum memory configuration: 16 DIMMs (4 groups of 4)
- Each memory option includes two DIMMs
- DIMMs must be added in matched groups of four (e.g., 2, 4, or 6 x 7002A)
- For best performance, systems should be configured with 8 or 16 identical DIMMs (add 2 or 6 identical memory options)

Step 5: Order Internal Storage Expansion Option (may be required)

Order one or two:	**6600A**	Eight-bay Storage Expansion Option

Notes:
- One is required in order to install 5–12 internal disk drives
- Two are required in order to install 13–20 internal disk drives
- Maximum of two per system
- Each 6600A uses one PCI slot (either 32 or 64-bit)
- A second power supply must be ordered if a 6600A is installed

Step 6: Order Internal Disks (optional)

Order:	**5214A**	4.2-GB, 7200-rpm, hot-swap UltraSCSI disk drive

Notes:
- Individual disks may be added
- Maximum configuration: 20 internal disks
- One 6600A 8-bay Storage Expansion Option must be installed to support 5–12 disks
- Two 6600A 8-bay Storage Expansion Options must be installed to support 13–20 disks
- A second power supply must be ordered if more than 4 disks are installed

Ordering Process for Full and Non-Full System Upgrades *(cont.)*

Ultra Enterprise 450 Full System Upgrades *(cont.)*

Step 7: Order Internal Removable Storage Device (optional)

Order one internal removable media device:	**6286A**	12–24-GB 4mm DDS-3 Tape Drive
	6213A	7–14-GB 8mm Tape Drive
	6107A	4–8-GB SLR Tape Drive

Notes:
- Maximum of one internal 5.25-inch, half-height tape drive may be installed

Step 8: Order PCI Host Adapters and Network Interface Cards (optional)

Select from:	**6540A**	Dual-channel Single-ended UltraSCSI Host Adapter, PCI
	6541A	Dual-channel Differential UltraSCSI Host Adapter, PCI
	1032A	SunSwift™ Adapter (UltraSCSI plus FastEthernet), PCI
	1033A	SunFastEthernet™ controller, PCI
	1034A	Sun QFE/P Sun™ Quad FastEthernet™ controller, PCI
	1035A	SunFDDI™/P single-attach adapter, PCI
	1036A	SunFDDI/P dual-attach adapter, PCI
	1039A	Sun TRI/P Token Ring Interface, PCI
	1040A	Sun HSI™/P High-Speed Serial Interface, PCI
	1041A	Sun SAI/P Multiport Serial Interface, PCI
	1044A	Sun GEM/P Gigabit Ethernet controller, PCI
	3660A	PGX Graphics Card, PCI

Notes:
- Maximum configuration: Ten PCI cards
- See *Ultra Enterprise 450 Options* table for maximum number of each card supported

Step 9: Order Additional Power Supplies (may be required)

Order one or two:	**9682A**	560 W Universal Power Supply

Notes:
- Maximum configuration: three power supplies (one is standard)
- A fully loaded system will operate on two power supplies. The third power supply provides redundancy for greater system availability
- A second power supply is required if four CPUs or more than four internal disks are ordered

Ordering Process for Full and Non-Full System Upgrades *(cont.)*

Ultra Enterprise 450 Full System Upgrades *(cont.)*

10: Order Power Cord/Country Kit (required)

Order:	**X3xxL**	Power Cord
	X35xxA	Type-5 Country Kit

Notes:
- Order an X3xxL power cord if the system will not require a local graphics console
- Order an X35xxA Country Kit if the system will host a local graphics console

Step 11: Order External Disk Storage Options (optional)

Order: See options list.

Notes:
- One SPARCstorage™ MultiPack or up to four SPARCstorage UniPack disks may be attached to the system's Fast/Wide SCSI port
- Additional SCSI storage devices may be supported by PCI SCSI host adapters

Step 12: Order External Tape Options (optional)

Order: See options list.

Notes:
- Up to four external SCSI tape devices may be attached to the system's Fast/Wide SCSI port
- Additional SCSI tape devices may be supported by PCI SCSI host adapters

Step 13: Order Other Options (optional)

Order: See options list.

Step 14: Submit *E450 Component Migration Assessment Form* with Order (required)

Obtain form by email: Send email to: e450_chassis_upgrade-ext@sun.com

Required when ordering the following:	
UG14-5UNC-9S-000ND **UG14-5UDB19S-000ND** **UG14-5UEC19S-000ND** **UG14-5UDB19S-000CD** **UG14-5UEC19S-000CD**	A declaration of quantity and type of compatible components that are migrating over to the Enterprise 450 must be submitted along with the sales order for Non-Full system upgrades

SunSpectrum℠ System Support Program

Sun recognizes the importance of the distributed network computing servers and the need for maximum uptime; therefore, Sun has bundled a 3-year, on-site, second-day warranty with every Ultra™ Enterprise™ 450 server. For customers wishing to upgrade this service, SunService™ offers attractive upgrade packages.

SunSpectrum℠ is an innovative and flexible service offering that allows customers to choose the level of service best suited to their needs, ranging from mission-critical support for maximum solution availability to backup assistance for self-support customers. SunSpectrum provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Solaris™ operating system software, and telephone support for Sun™ software packages. The majority of Sun's customers today take advantage of the SunSpectrum program, underscoring the value it represents. Customers should check with their local SunService representatives for program and feature variance and availability in their areas.

FEATURE	SUNSPECTRUM℠ PLATINUM℠ Mission-Critical Support	SUNSPECTRUM℠ GOLD℠ Business-Critical Support	SUNSPECTRUM℠ SILVER℠ Systems Support	SUNSPECTRUM℠ BRONZE℠ Self Support
Systems Features				
Systems approach coverage	Yes	Yes	Yes	Yes
System availability guarantee	Customized	No	No	No
Account Support Features				
Service account management team	Yes	No	No	No
Personal technical account support	Yes	Yes	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On-site account reviews	Monthly	Semi-annual	No	No
Site activity log	Yes	Yes	No	No
Coverage / Response Time				
Standard telephone coverage hours	7 day/24 hour	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday
Standard on-site coverage hours	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday	N/A
7 day/24 hour telephone coverage	Yes	Yes	Option	No
7 day/24 hour on-site coverage	Yes	Option	Option	N/A

SunSpectrum System Support Program *(cont.)*

FEATURE	SUNSPECTRUM PLATINUM Mission-Critical Support	SUNSPECTRUM GOLD Business-Critical Support	SUNSPECTRUM SILVER Systems Support	SUNSPECTRUM BRONZE Self Support
Customer-defined priority setting	Yes	Yes	Yes	No
– Urgent (phone/on-site)	Live transfer/ 2 hour	Live transfer/ 4 hour	Live transfer/ 4 hour	4 hour / N/A
– Serious (phone/on-site)	Live transfer/ 4 hour	2 hour/next day	2 hour/next day	4 hour / N/A
– Not critical (phone/on-site)	Live transfer/ customer convenience	4 hour/ customer convenience	4 hour/ customer convenience	4 hour / N/A
Additional contacts	Option	Option	Option	Option
Enhanced Support Features				
Mission-critical support team	Yes	Yes	No	No
Sun Vendor Integration Program (SunVIP™)	Yes	Yes	No	No
Software patch management assistance	Yes	No	No	No
Field change order (FCO) management assistance	Yes	No	No	No
Remote Systems Diagnostics				
Remote dial-in analysis	Yes	Yes	Yes	Yes
Remote systems monitoring	Yes	Yes	No	No
Remote predictive failure reporting	Yes	Yes	No	No
Software Enhancements and Maintenance Releases				
Solaris enhancement releases	Yes	Yes	Yes	Yes
Patches and maintenance releases	Yes	Yes	Yes	Yes
Sun unbundled software enhancements	Option	Option	Option	Option
Internet and CD-ROM Support Tools				
SunSolve™ license	Yes	Yes	Yes	Yes
SunSolve EarlyNotifier℠ service	Yes	Yes	Yes	Yes